

# PATENT SPECIFICATION

(11) 1 525 656

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- (21) Application No. 46623/76 (22) Filed 9 Nov. 1976  
 (44) Complete Specification Published 20 Sep. 1978  
 (51) INT CL<sup>2</sup> F24D 13/02  
 A01K 41/00  
 (52) Index at Acceptance  
 F4U 70  
 A1M 91  
 F4V A1A B1F B3D

(19)



## (54) INCUBATORS FOR NURSING CHICKS

(71) We, WAY-CHAW CHENG, HSIEN-YOUNG YOU and CHING-CHI LIU, are citizens of Taiwan, residing at respectively No. 1, Shui-T'a Erh Lane, Chung-Shan Li, Chu-Shan Chien, Nan-Tou Hsien, Taiwan; No. 185, Fu-Hsing Ts'un, Chi-An Hsiang Hua-Lien Hsien, Taiwan, and No. 374, Chung-Cheng Road, Hua-Lien, Taiwan, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:-

15 This invention relates to an incubator used in growing poultry.

As well known in the art of poultry, brooding chicks is one of the most difficult stages in growing chickens. In particular, the first 300 hours of a chick's life are by far the most important. This is the time when the grower makes or breaks his flock. Therefore, the grower normally tries his best to take special care during brooding to insure that the chickens are started properly. For instance, chicks are started at a temperature of about 32.2 degrees to 35 degrees C, the temperature should then be reduced by 2.8 degrees each week until reaching room temperature, and the chicks are carefully watched for signs of temperature, humidity, feed, water or disease problems, etc. Particularly, for the purpose of a well-controlled temperature condition, the prior art has suggested a brooder equipment capable of artificial heating.

One of the conventional equipments is of a type including a plurality of metallic conduits in which heated water or hot spring water is circulated for heating the bedding

material from underneath. However, the equipment of this type has never become popularly available because of certain disadvantages per se, such as, the equipment entails great expense for installation and heat supply, the equipment is limited to a particular place where heated water is obtainable, and the metallic conduits of the equipment will be readily blocked by impurities in the water and require frequent maintenance. Another type of the conventional equipment is implemented by applying on the ground surface a plurality of aluminium tubes containing electric heating elements and covering the aluminium tubes with earth and sand or other bedding materials for chick's litter, such that the heat produced by the electric heating elements will emanate from the bottom and maintain a desired ambient temperature. Although this type of construction has obviated the disadvantages resulted from using hot water as heat source, it still cannot be put into practical use due to the laborious replacement work of the applied earth and sand after a period of use, great power consumption and low efficiency.

Still another type of the conventional equipment, which is a preferable one heretofore used, includes an umbrella-like rigid hood made of metal. Inside the umbrella-like hood and adjacent to the center of the top of the hood, a gas burner or electric heater means is mounted, and the hood is hung or otherwise supported in the middle of the chicken house about 60 cm from the bedding material, such that, when in use, the heat produced by the gas burner or electric heater means is reflected by the inner face of the hood and directed downward

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onto the bedding material to render warming from above, for the chicks beneath the hood.

Nevertheless, the last mentioned brooder equipment has also encountered various disadvantages. For example, the conventional umbrella-like hood is made of opaque material, i.e. metal, and thus will shield the chicks therebeneath from the sight of the grower. The grower has to crouch his body and lift the hood if he wants to observe the actions of the chicks beneath the hood. Accordingly, it is possible that the grower may be unaware of an accident and that one chick has been dead under the hood for a long time due to oxygen starvation. The hood including a gas burner, and gas container make the whole equipment weighty and inconvenient to move or to install, and the rigid hood having a relatively large diameter takes up too much space and thus is difficult to store when not in use. Moreover, the heat reflected from the hood is not uniformly distributed in the space beneath the hood and results in inconformity of temperature of the bed. In consideration of a chick's physiological requirements, since the heat is provided from the top, the abdomen side of the chick sleeping on the bed will be cooler than the back side, this condition tends to give rise to chicken disease problems such as dysentery. Therefore, such conventional brooder equipment actually produces a temperature condition not very suitable for the physiological requirements of a chick, and in general, by means of such brooder equipment the flock of chicks will not grow up in a healthy manner. Moreover, when in use, the periphery of the hood is spaced from the bed at least about 25 - 30 cm, a great portion of the heat reflected from the hood will be laterally directed at the periphery of the hood via the gap between the hood and the bedding material, and not reach the bed. Thus, such a brooder equipment presents low efficiency and entail great expense.

It is therefore an object of this invention to provide an incubator for nursing baby chicks, which mitigate the various disadvantages and inconvenience encountered with the conventional equipment and may operate in an optimum condition.

According to the present invention there is provided an incubator for nursing chicks comprising in combination: an electrical heater formed of a flexible material and containing an electric heating element; a hood including a collapsible frame and an entirely transparent, flexible canopy attached to the frame for covering the electric heater to define a space therein capable of retaining heat emitted from the heater, in use; and a thermostat disposed in the space between the heater and the hood to control auto-

matically the supply of electric current to the heater so as to maintain the space at a predetermined temperature for the chicks; wherein, the collapsible frame includes a plurality of dome ribs, each rib having one end pivotably connected to a ring-shaped crown in circumferentially spaced relation, a tubular member adapted to extend through the center of the ring-shaped crown, a stretcher member for each rib, each stretcher member having one end pivotably connected to the tubular member and one end pivotably connected to its respective rib in such a manner that the tubular member is substantially aligned with the axis of the ring-shaped crown so that the frame is opened to support the canopy in a dome-like shape when the tubular member is moved along the axis of the ring-shaped crown to a position in which the upper end of the tubular member extends through the ring-shaped crown, and the frame is closed to collapse the canopy when the tubular member is removed from the ring-shaped crown.

In one preferred embodiment the incubator comprises the electric heater including a bottom layer of heat resistant and electrically insulating material, a top layer of heat resistant and electrically insulating material and a set of electric heating elements applied and sandwiched between the top and bottom layers, and a collapsible hood including a canopy of transparent material and a frame, similar in structure to that of an umbrella frame, for supporting the canopy. When in use, the transparent hood is opened and supported in a manner that the hood covers the heater while the skirt of its canopy is spaced from the heater with a gap for chick's entrance, the electric heating elements of the heater are energized and thermostatically controlled to maintain the space defined between the transparent hood and the heater at a desired ambient temperature for chicks.

Preferably means for ventilation are provided on the top center of the hood, and an electric lamp is mounted on the frame inside the hood to act as an inducement to make the chicks get into a habit of entering the hood for warming their bodies. Moreover, the gap existing between the skirt periphery of the canopy and the heater, which serves as an entrance for the chicks, is normally covered with flaps depending from the skirt of the canopy. The flap is preferably of the same material as the canopy, and can be flexibly deflected by the chicks entering or leaving the hood. With such arrangement, the canopy in combination with the flaps thus successfully effects excellent heat retention.

In accordance with the invention the electric heater is covered with a collapsible hood

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having flaps suspended from its periphery which present minimum loss of heat, high efficiency and low cost; the uniform heating from the bottom of the incubator and good ventilation result in an ambient temperature which meets the physiological requirements of the chicks and enables the chicks to pack on the heater uniformly and comfortably; the transparency of the collapsible hood enables the grower to watch, in any direction from outside the apparatus, the actions of the chicks, and thus facilitates the grower's supervision. The provision of an inducement lamp inside the hood serves to lead, free from the grower's intervention, the chicks to go to the heater for taking warmth, and causes the chicks to get into the habit of entering the hood for warming. Advantageously, the light weight of the incubator and the fact that when not in use the hood can be collapsed and wrapped up in the flexible electric heater so as to form a small package contribute to the convenience and ease of handling such as movement, installation and store.

An embodiment of the present invention will now be described, by way of example, with reference to the accompanying drawings, in which:

Fig. 1 is a perspective view of one embodiment of the transparent umbrella-like bottom-heating type incubator for nursing chicks according to this invention;

Fig. 2 is a perspective view of an electric heater included in the apparatus of Fig. 1, with the top layer thereof partially cut away to show the electric heater elements disposed therein;

Fig. 3 is a sectional view of a thermostat used in the apparatus of Fig. 1 for adjusting and maintaining a predetermined ambient temperature for chicks; and

Fig. 4 is an electric circuit diagrammatically showing the connection and interrelation between the heating elements of the heater and the thermostat.

Reference is now made to the drawings for a better understanding of this invention, wherein similar reference characters designate corresponding parts throughout the several views. As is evident in Fig. 1, an incubator according to this invention, generally designate by numeral 1, comprises a collapsible hood 11 and a heater 12 which forms the floor area of the incubator. The collapsible hood 11 includes an umbrella-like frame covered with a transparent canopy 117. As can be seen, the frame includes dome ribs 111 hinged by means of a tie wire (not shown) to a ring-shaped crown 112 as is well known. The frame includes a runner 113 fixedly secured to a tubular member 14 which is movable relative to the crown 112 to erect or collapse the incubator. To the runner 113 is connected a plurality of

stretcher members 114, one for each dome rib 111. The stretcher member 114 extends between the runner 113 and a clip 115 located on the rib 111. Each stretcher member 114 is pivotably connected to the runner 113 by tie wires (not shown) as is well known, and to the clip 115 by pivot pin 119. The frame may be opened to assume an umbrella shape by pushing the tubular member 14 upward to a position in which the upper end of the tubular member 14 extends through the center of the ring-shaped crown 112 and is maintained in this position by a releasable latch member 141. Supporting members 116 are provided at the other end of alternate ones of the dome ribs 111. The supporting member 116 is connected, at one end, to the dome rib 111, but can be folded inward by pivotal movement about the joint therewith. When the frame is opened, the supporting members 116 are arranged to stand on the ground so as to support the frame as well as the canopy 117, on the top of the heater 12 as shown. The canopy 117 is made of a piece of transparent material, and when the hood 11 covers the heater 12, the periphery of the canopy 117 is spaced from the heater by a gap which serves as an entrance for the incubator. The gap is normally closed by a flap 118 depending from the periphery of the canopy 117. The flap 118 is preferably made of the same material as the canopy and can be flexibly deflected inwardly or outwardly by chicks entering or leaving the hood.

A plurality of openings 142 are provided extending through the wall of the tubular member 14. The openings 142 contribute to improve ventilation of the incubator 1. At the lower end of the tubular member 14, there is provided an electric lamp 13 which can be connected to a power supply through an electric cord 131 and a plug 132. The lamp 13, when energised, serves as an inducement to make the chicks get into a habit of entering the incubator for warming their bodies.

The electric heater 12 is electrically connected to a power supply through a thermostat 15, an electric cord 151 and a plug 152. While being energised, the heater 12 supplies heat from bottom of the incubator, which is warmed up and the thermostat 15 on the heater 12 serves to control the on-off of electric current so as to maintain a predetermined temperature in a manner as will be hereinafter more fully apparent.

Now turning to Fig. 2, the electric heater 12 is shown in perspective view with part cut away for illustration. The heater 12 includes a bottom layer 121 of heat resistant and electrically insulating material, a top layer 122 of heat resistant and electrically insulating material, and heating elements 123 such

as nickel-chrome wire heaters sandwiched between these two layers. The top layer 122 and the bottom layer 121 are glued together by any means known to those skilled in the art. The heater elements 123 may include six nickel chrome wires of 0.40 mm in diameter parallelly connected and distributed in a plane between the top and bottom layer in a manner such that, when in use the temperature will be substantially uniform over the entire surface of the bed. The heater elements 123 are electrically connected to the thermostat 15 through electric cord 124 in order that the current supplied to the heater will be controlled during operation by the thermostat.

Fig. 3 is a sectional view of the thermostat 15. The thermostat 15 includes a housing 153, an indicating lamp 154 mounted on the housing, and an insulating support plate 155 mounted inside the housing. On the insulating plate 155, there are provided a pair of electrically conductive contacts 156 and 157. Heat sensing means 158 are attached to the contact 157, and an adjusting screw 159 having a knob 160 extends through a hole 161 of the housing and a threaded opening of the insulating plate 155 such that the end of the screw 159 is directed toward the heat sensing means 158 and thus the distance from the end of the screw 159 to the heat sensing means 158 may be adjusted by turning the knob 160. The heat sensing means 158, when being subjected to heat, will expand. Contacts 156 and 157 are normally held in contact with each other to complete a circuit, however, when the heat sensing means 158 develop sufficient expansion to come into contact with the end of the screw 159, the contact 157 will be biased to a position in which contacts 156 and 157 are separated so as to turn off the electric circuit. A socket 164 is mounted on the housing and electrically connected for plug-type connection with the heater elements of the heating bed 12. The lamp 154 is connected for indicating the on-off of the circuit, i.e. the lamp 154 lights up as the circuit is on while extinguished when the circuit is off. Fig. 4 diagrammatically illustrates the electrical connection of the plug 152, thermostat 15, indicating lamp 154 and heating elements 123 included in the apparatus of Fig. 1. With such arrangement, the temperature in the apparatus may be maintained at a predetermined level. The function of the thermostat 15 is to obtain an ambient temperature that makes the chicks comfortable. However, it is actually impossible to recommend an exact thermostat setting for each apparatus, watching the actions of the chicks is a much better indication of comfort than thermostatic setting. That is to say, when the apparatus is in operation, after the chicks enter the apparatus, if they are

loosely packed on the heater, it means that the thermostat is set properly. If the chicks are not loosely packed, but tend to crowd on the bed, the chicks are too cool and the heat needs to be increased. If the chicks are in a wide circle outside the apparatus, the thermostat setting should be lowered to conserve power and make the chicks more comfortable. Such adjustment is achieved by turning the knob 160 of the thermostat.

#### WHAT WE CLAIM IS:-

1. An incubator for nursing chicks comprising in combination: an electrical heater formed of a flexible material and containing an electrical heating element; a hood including a collapsible frame and an entirely transparent, flexible canopy attached to the frame for covering the electric heater to define a space therein capable of retaining heat emitted from the heater, in use; and a thermostat disposed in the space between the heater and the hood to control automatically the supply of electric current to the heater so as to maintain the space at a predetermined temperature for the chicks; wherein, the collapsible frame includes a plurality of dome ribs, each rib having one end pivotably connected to a ring-shaped crown in circumferentially spaced relation, a tubular member adapted to extend through the center of the ring-shaped crown, a stretcher member for each rib, each stretcher member having one end pivotably connected to the tubular member and one end pivotably connected to its respective rib in such a manner that the tubular member is substantially aligned with the axis of the ring-shaped crown so that the frame is opened to support the canopy in a dome-like shape when the tubular member is moved along the axis of the ring-shaped crown to a position in which the upper end of the tubular member extends through the ring-shaped crown, and the frame is closed to collapse the canopy when the tubular member is removed from the ring-shaped crown.

2. An incubator as claimed in Claim 1, wherein the electrical heater comprises heat resistant and electrically insulating material.

3. An incubator as claimed in Claim 1 or 2, wherein the tubular member is provided with means for ventilation.

4. An incubator as claimed in Claim 1, 2 or 3, wherein the hood further includes support member each having one end connected to the outer end of the dome rib and one end grounded, such that, when in use, the lower periphery of the canopy is spaced from the heater by a gap which serves as an entry to the incubator, and flaps, depending from the periphery of the canopy to substantially shield the entrance, are readily deflected inwardly or outwardly of the incubator by the chicks.

5 5. An incubator as claimed in Claim 2 drawings.  
wherein the electrical heater contains at  
least one electric heating element, and being  
made flexible so that the heater, when not in  
use, is collapsible into a compact size.

6. An incubator substantially as  
hereinbefore described with references to,  
and as illustrated in, the accompanying

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Printed for Her Majesty's Stationery Office, by Croydon Printing Company Limited, Croydon, Surrey, 1978.  
Published by The Patent Office, 25 Southampton Buildings, London, WC2A 1AY, from  
which copies may be obtained.



